

# Characteristics Associated with Sex After Periods Of Abstinence Among Sexually Experienced Young Women

**CONTEXT:** Adolescent pregnancy prevention is difficult because adolescent sex is intermittent. Understanding why sexually experienced adolescents have sex after a period of abstinence will help clinicians to tailor counseling.

**METHODS:** For up to 4.5 years between 1999 and 2006, a sample of 354 adolescent women recruited at urban primary care clinics were interviewed and tested for STDs every three months, and were asked to complete three months of daily diaries twice a year. Survival analyses were used to estimate associations between intrapersonal, relationship and STD-related characteristics and the risk of ending an abstinence period with sex.

**RESULTS:** Participants reported 9,236 abstinence periods, which averaged 31 days. The risk that an abstinence period ended with sex increased steeply for periods of fewer than 17 days (short), rose less steeply for 17–39-day (intermediate) periods and was fairly steady for longer periods. For short periods, the risk increased with age, sexual interest, positive mood, partner support, relationship quality and history of STD diagnosis more than three months ago (hazard ratios, 1.02–1.2); it decreased as negative mood increased (0.98) and was reduced among adolescents with a recent STD diagnosis (0.9). For intermediate periods, the association with a recent STD diagnosis became positive (1.4). For long periods, sex was associated only with age, sexual interest and relationship quality.

**CONCLUSIONS:** To provide targeted and timely sexual health counseling, clinicians may want to ask adolescents not only whether they are sexually active but also when they last had sex.

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Counseling sexually experienced adolescent women about pregnancy and STD prevention is difficult because their sexual encounters are often intermittent, separated by periods of days, weeks or months. These periods may be said to constitute abstinence, in that no sexual activity occurs and, often, none is planned.<sup>1</sup> However, “abstinence” is poorly defined across research, program, policy and clinical realms.<sup>2–4</sup> There is no consistency in what length of time without sex determines “abstinence,” which behaviors it includes, or whether it is a matter of behavior, intention or motivation.<sup>5–7</sup>

During the last decade, large public investment in “abstinence-only” sex education diminished curricular attention to topics that are relevant to adolescents with sexual experience, such as contraception, condom use and decision making about sex within relationships.<sup>8</sup> Additionally, the sociocultural and clinical emphasis on first sex as both transformative and risky is so strong, many adolescents themselves say that once they have initiated sexual experience, they cannot return to abstinence.<sup>7</sup> Yet, abstinence is still relevant to sexually experienced adolescents: In several studies, 10–20% of sexually experienced adolescents have reported no intercourse within the past 3–6 months.<sup>9–11</sup> Few prevention programs or clinical guidelines take into account the varying patterns of sexual abstinence among sexually experienced adolescent women. Yet, such data would help clinicians to better target abstinence and sexuality counseling.

Predictors of general adolescent sexual decision making have been well studied. Three areas of importance are intrapersonal characteristics, such as mood and sexual interest;<sup>12,13</sup> relationship characteristics, such as intimacy and relationship quality;<sup>14,15</sup> and STD-related characteristics, such as risk perception and recent infection.<sup>9,16</sup> These areas are drawn from attribution theory, which suggests that individuals explain their behavior as results of interactions among intrapersonal, interpersonal and situational contexts.<sup>17</sup> While relevant characteristics have been closely examined in terms of their associations with first sexual experiences, less is known about their associations with the decision to have sex again after periods of abstinence of different lengths. Our objectives were to describe intrapersonal, relationship and STD-related characteristics associated with the risk of having sex after a period of abstinence among adolescent women at high risk of pregnancy and STDs, and to examine whether these characteristics differ for periods of abstinence of varying durations.

## METHODS

### Participants and Procedures

As part of a larger cohort STD study, 354 adolescent women were enrolled from primary care clinics in Indianapolis neighborhoods with high STD rates, and were followed for up to 4.5 years between 1999 and

2006. The clinics serve primarily low- and middle-income urban communities with high rates of early sexual onset and STDs<sup>18</sup>—populations of particular interest for STD and pregnancy prevention efforts. To be eligible for inclusion, women had to be 14.0–17.9 years old at enrollment and not pregnant. Sexual experience was not an inclusion criterion, but 81% of participants were sexually experienced at enrollment. Each adolescent provided written consent, and parents provided written permission. The study was approved by the institutional review board of Indiana University Purdue University at Indianapolis–Clarian.

The larger study utilized both quarterly interviews and three-month periods of daily diary collection; detailed descriptions of study procedures have been published elsewhere.<sup>12,19</sup> Each diary collection period was initiated and terminated by a quarterly interview and was followed by a rest period of similar length; thus, two diary collection periods occurred per year. The face-to-face interviews covered a range of partner-specific behaviors and relationship attributes. At enrollment and quarterly visits, participants were tested for *Chlamydia trachomatis*, *Neisseria gonorrhoeae* and *Trichomonas vaginalis* using polymer chain reaction on self- or provider-collected vaginal swabs.

### Measures

Our choice of measures was influenced by clinical relevance and previous empirical data,<sup>9,12–16</sup> and draws from attribution theory.<sup>17</sup>

•**Abstinence periods.** Our unit of analysis was an abstinence period, defined as one or more consecutive days on which no vaginal sex was reported in the daily diary. Abstinence periods started the day after a diary report of sex and ended with a diary report of sex. They were censored by either a missing diary day or the start or end of a diary period; a single participant could contribute multiple abstinence periods. Abstinence periods are defined solely by behavior, irrespective of motivations, attitudes or moral characteristics (e.g., self-discipline or dependability) that are commonly part of the definition of adolescent abstinence.<sup>7</sup> To retain our focus on sexually experienced adolescents, we omitted from the analysis abstinence periods prior to or ending in a first episode of vaginal sex (coital debut).

•**Intrapersonal characteristics.** Two scales assessed mood, and one sexual interest; each used a five-point Likert-type response scale with possible responses ranging from “not at all” to “all day.” The positive mood scale consisted of three items, asking whether the participant had felt cheerful, happy or friendly that day (Cronbach’s alpha, 0.81; range, 3–15).<sup>12</sup> The negative mood scale consisted of three items, asking whether the participant had felt irritable, angry or unhappy that day (Cronbach’s alpha, 0.76; range, 3–15).<sup>12</sup> Sexual interest was measured by a single item, asking whether the participant was interested in having sex at any point during that day (range, 1–5).<sup>12</sup>

One question asked whether participants used sexual abstinence to avoid pregnancy. The question was added midway through the study period and was asked of only 108 participants; 9% of this subgroup reported using abstinence to avoid pregnancy. The subgroup was too small to include in the larger analysis.

•**Relationship characteristics.** At enrollment and each follow-up visit, participants were asked to identify sex partners by first name or initial so that we could examine partner-specific attitudes and behaviors within a specific interview or diary. Two partner-specific relationship characteristics were measured: daily partner support and quarterly relationship quality. Daily partner support was based on four diary items, assessing whether each of the following had occurred each day: “We talked about my feelings”; “He let me know he cared about me”; “He made me feel loved”; and “He made me feel special” (Cronbach’s alpha, 0.86; range, 0–4). Higher scores indicated greater partner support for the day.

Quarterly relationship quality was based on six items that assessed positive emotional and affiliational aspects of a relationship. These items, measured on a four-point Likert-type scale (“strongly disagree” to “strongly agree”), included “We have a strong emotional relationship” and “He is a very important person in my life” (Cronbach’s alpha, 0.91; range, 6–24). We were unable to link partners mentioned in quarterly interviews to partners named in the diaries, because participants were inconsistent in their spelling of first names and use of first names as opposed to nicknames in the diaries. We therefore assessed relationship quality for the first partner named in the interview. This is a reasonable approximation, as participants named only one sexual partner in 99.6% of diary entries in which sex was recorded and reported only one partner in 83% of interviews in which the number of partners was reported.

•**STDs.** A participant who tested positive for an STD at the quarterly visit at the start of the diary collection period was categorized as having had a “recent STD.” A participant who had tested positive at any previous quarterly interview was categorized as having had a “distant STD.” We differentiated between recent and distant STDs because previous research by our group has shown that temporary periods of abstinence are a common response to a new STD diagnosis.<sup>9</sup>

### Analysis

We used a survival analysis approach to examine the length of abstinence periods. First, we plotted the cumulative hazard of sex after an abstinence period. The cumulative hazard plot had three distinct sections with different slopes, showing first a sharp increase in risk, then a less steep rise and finally a leveling off (Figure 1). On the basis of this pattern, we categorized abstinence periods as short (fewer than 17 days), intermediate (17–39 days) or long (40–112 days). Abstinence periods longer than the diary collection period (three months) were treated as censored, which limited our ability to examine even longer periods

of abstinence. Censoring was common: Some 37% of all abstinence periods and 92% of long ones were censored.

We used frailty models (proportional hazard models that control for multiple observations from each participant) to estimate the association between intrapersonal, relationship and STD-related characteristics and the risk, or hazard, of ending short, intermediate and long abstinence periods.<sup>20</sup> In contrast to survival models, which would have estimated the population average hazard of sex ending an abstinence period, the frailty models estimated the within-subject hazard, by incorporating into the model each participant's own risk for having sex. This allowed us to examine how specific behaviors were related within individuals, rather than how behaviors differed between groups of individuals. A separate model was used for each intrapersonal, relationship and STD-related characteristic.

We performed three sensitivity analyses. First, we examined the influence of missing diary data by imputing missing data, running the models and comparing results from the models using imputed missing data with those counting missing data as censored. The imputation was performed by comparing a random number generated from a uniform distribution to the subject-specific daily probability of having sex. If the subject-specific probability was less than the random number, then a sexual event was imputed. The proportion of abstinence periods that were censored was smaller in the models using imputed data than in the original (30% vs. 39%), but associations with intrapersonal, relationship and STD-related measures were similar across models. Randomly censored data should not influence our point estimate, but should cause wider confidence intervals,<sup>20</sup> and our imputations did not suggest systematic missing data; therefore, for our final models, we treated missing diary days as censored.

Second, we examined the influence of the length of the abstinence period on results by running analyses using just two cut points (14 and 21 days). We observed similar results for both cut points. We chose to use our empirically derived three groups, as the results for the short and long periods were robust at several cut points, and we were able to examine the periods of intermediate length.

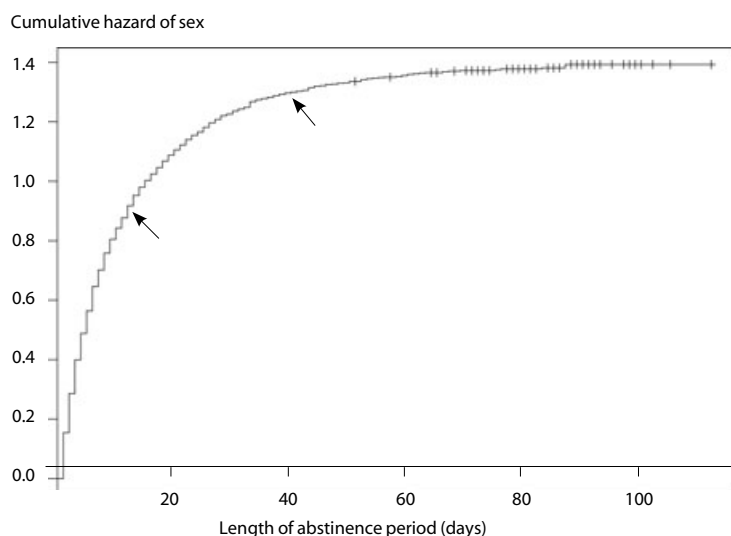
Third, we examined the possibility that pregnancy may influence models of long abstinence periods. From a quarterly interview question asking about current pregnancy, we identified 670 (out of 9,236) abstinence periods in which the participant was pregnant. We compared censoring during periods in which the participant was pregnant (29% censored) and for all abstinence periods (37%). We then reran the models, excluding abstinence periods in which the participant was pregnant. Results were similar to those from the models using all data, so we used all data.

## RESULTS

### Participants and Abstinence Periods

Ninety percent of participants were black, 8% were white and 2% were members of other racial groups or were multiracial. On average, each participant contributed 334

**FIGURE 1. Cumulative hazard of sex after a period of abstinence among a sample of adolescent women attending clinics in Indianapolis, by length of abstinence period, 1999–2006**



Note: Arrows mark cut points defining abstinence periods as short (fewer than 17 days), intermediate (17–39 days) or long (40–112 days).

diary days (range, 5–783) and completed 96% of entries per diary period (standard deviation, 10%). Past work has not shown significant bias in diary completion or item nonresponse within returned diaries.<sup>12</sup>

In all, participants contributed 1,573 diary periods. Their mean age at the start of these periods was 17.3 years (Table 1). On average, for each diary collection period, women rated both their positive and their negative mood in the middle of the range (means, 9.2 and 5.7, respectively), their interest in having sex in the low end of the range (1.6) and their daily partner support in the middle of the range (1.9); average quarterly relationship quality was in the upper end of the range (19.5). Participants had an STD diagnosed at the start of 17% of diary periods and had a history of an STD in 63% of diary periods.

The 354 participants contributed 9,236 abstinence periods. Sixty-three percent of these periods ended with a diary

**TABLE 1. Selected characteristics of women at the start of daily diary periods in a study of characteristics associated with sex after a period of abstinence**

Characteristic	Mean or % (N=1,573)
<b>Means</b>	
Age	17.3 (1.8)
Daily positive mood (range, 3–15)	9.2 (3.6)
Daily negative mood (range, 3–15)	5.7 (2.9)
Daily sexual interest (range, 1–5)	1.6 (1.1)
Daily partner support (range, 0–4)	1.9 (1.7)
Quarterly relationship quality (range, 6–24)	19.5 (3.9)
<b>Percentages</b>	
Recent STD	17.1
Distant STD	63.1

Notes: A total of 354 women contributed diary periods. Figures in parentheses are standard deviations. A recent STD is one that was diagnosed at the beginning of a quarterly diary period; a distant STD is one that was diagnosed in a previous period.

report of sex, and 37% were censored. The mean length of an abstinence period was 31 days (standard error, 1.0), the median length was seven days (95% confidence interval, 6–7) and the range was 1–112 days.

**Predictors of the Risk of Ending an Abstinence Period**

•**Short abstinence periods.** The risk of ending a short abstinence period with sex was associated with all intrapersonal, relational and STD-related characteristics in the model (Table 2). As indicated by hazard ratios of 1.02–1.2, the risk increased by 7% with each one-year increase in age, 3% with each one-unit increase in daily positive mood, 14% with each one-unit increase in either daily sexual interest or daily partner support, 2% with each one-unit increase in quarterly relationship quality and 16% with a distant STD. The risk that sex ended a short abstinence period declined by 2% with each one-unit increase in daily negative mood and by 9% if the woman had a recent STD diagnosis (hazard ratios, 0.98 and 0.9, respectively).

While the hazard ratios for mood and relationship quality appear small, they are for one-unit increases only. The mood scales ranged from 3 to 15, the relationship quality scale from 6 to 24. For positive mood, an increase from the scale midpoint to the upper end is six units, which translates to an increase of 18% in the risk that sex will end a short abstinence period; a similar increase in negative mood translates to a 12% decrease in risk. For relationship quality, an increase from the midpoint of the scale to the upper end is nine points, which translates to an 18% increase in risk.

•**Intermediate abstinence periods.** Results for intermediate abstinence periods resembled those for short abstinence periods, showing associations between risk and age, negative mood, sexual interest, relationship characteristics and recent STD. However, they differed in two important respects. First, positive mood was not associated with a significant change in the risk that an intermediate abstinence period would end with sexual activity. Second, a recent STD, which was associated with a reduced risk that sex would end a short abstinence period, predicted a 40% increase in the risk of sex after an intermediate abstinence period.

•**Long abstinence periods.** In long abstinence periods—as in intermediate and short ones—risk was associated with age, daily sexual interest and quarterly relationship quality. The hazard ratios translate to increases of 24% for each year of age, 33% for each one-unit increase in sexual interest and 10% for each one-unit increase in relationship quality. However, none of the mood or STD measures were associated with the risk of sex ending a long abstinence period.

**DISCUSSION**

Characteristics associated with the risk of an adolescent woman’s having sex after a period of abstinence differed according to how long she had been abstinent. Beyond our overall results, three findings, in particular, extend our understanding of adolescent sexual behavior.

First, having an STD diagnosed at the visit just prior to the abstinence period was associated with a reduced risk of sex for short abstinence periods, but with an elevated risk for intermediate ones. This switch is consistent with research showing that after a period of abstinence in response to an STD diagnosis, many adolescents resume their relationship with the same partner.<sup>9,18</sup> We hypothesize that the switch may reflect relationship turmoil after an STD, followed by “making up.” The literature on adolescent sexual decision making suggests two potential mediators of this finding: changes in perceived STD risk, and changes in partner closeness and relationship quality.<sup>12,16,21,22</sup> Alternatively, the switch could reflect adherence to the Centers for Disease Control and Prevention’s (CDC’s) STD treatment guidelines, which recommend abstinence until therapy is completed.<sup>23</sup> From a clinical perspective, this result suggests that in the context of an STD diagnosis, counseling for posttreatment abstinence may not be sufficient; anticipation of resumption of sexual activity is also warranted. Return visits for retesting, as suggested by CDC guidelines,<sup>23</sup> could provide an opportunity for reinforcement of STD and pregnancy prevention messages that include abstinence as an option. From a program perspective, this switch suggests that fear-based STD prevention strategies may be misguided and that STD prevention should instead focus on the relationship contexts of sexual decision making.

Second, positive mood was associated with the decision to have sex only after short periods of abstinence. A number of studies demonstrate associations between depressed mood and sexual risk behaviors.<sup>24–27</sup> However, studies using daily diaries and momentary sampling have demonstrated close temporal associations between improved mood and sexual thoughts and behaviors.<sup>12,25,28</sup> Our work demonstrates that these associations are important to decisions about sex after short periods of abstinence, but not after intermediate or long ones. From a clinical perspective, the associations between intrapersonal characteristics, such as mood, and sexual behavior warrant attention when counseling individuals after short periods of abstinence.

**TABLE 2. Hazard ratios (and 95% confidence intervals) from univariate frailty models assessing associations between selected characteristics and the risk that an abstinence period will end with sexual intercourse, by length of interval**

Characteristic	Short	Intermediate	Long
Age	1.07 (1.05–1.09)***	1.08 (1.01–1.15)*	1.24 (1.05–1.45)*
Daily positive mood	1.03 (1.02–1.04)***	1.02 (0.99–1.05)	0.99 (0.92–1.07)
Daily negative mood	0.98 (0.97–0.99)***	0.95 (0.92–0.99)**	1.03 (0.93–1.13)
Daily sexual interest	1.14 (1.11–1.17)***	1.16 (1.07–1.25)***	1.33 (1.07–1.67)*
Daily partner support	1.14 (1.12–1.17)***	1.12 (1.05–1.18)***	1.14 (0.96–1.34)
Quarterly relationship quality	1.02 (1.01–1.03)***	1.05 (1.02–1.08)**	1.10 (1.01–1.19)*
Recent STD	0.91 (0.83–1.00)*	1.40 (1.06–1.85)*	0.93 (0.43–2.00)
Distant STD	1.16 (1.03–1.29)*	1.18 (0.90–1.54)	1.30 (0.67–2.52)

\*p<.05. \*\*p<.01. \*\*\*p<.001. Note: A short abstinence period is fewer than 17 days, intermediate is 17–39 days and long is 40–112 days.

Third, in contrast to our findings regarding mood, relationship quality and sexual interest showed associations with an elevated likelihood of sex for short, intermediate and long abstinence periods. These findings are consistent with findings from both qualitative and quantitative work demonstrating that romantic relationships, relationship quality and intimacy are important to sexually experienced adolescents.<sup>7,29–31</sup> Our findings bridge short-term studies demonstrating the importance of relationship quality in sexual decisions<sup>12</sup> and longer term, longitudinal studies with similar findings.<sup>21</sup> The importance of relationships in abstinence periods of varying lengths additionally challenges commonly held assumptions about adolescent sexual behavior. Adolescent sexual intercourse is frequently presented as an entirely opportunity-driven risk behavior. Our data present a more nuanced picture, in which sexual intercourse is associated with important relationship attributes, such as partner support and perceptions of relationship quality. A developmental framework that identifies sexual intercourse as an expression of relationship closeness and commitment may be more appropriate.

### Limitations

This analysis has a number of limitations. First, the large amount of censored data decreases precision and leads to relatively large confidence intervals. This may have limited our ability to detect small differences between groups. Second, we examined only vaginal sex, because anal and oral sex carry different pregnancy and STD risks, and other analyses by our group suggest that characteristics associated with oral and anal sex differ.<sup>32</sup> Third, we defined abstinence periods purely in terms of behavior, although in practice the designation of abstinence often has value and contextual implications.<sup>7</sup> Fourth, abstinence has many potential reasons, including partner-related, motivational and circumstantial characteristics that we did not address—for example, relationship dissolution, partner change, parental supervision and the use of hormonal contraceptives. Finally, our study was conducted among urban, black young women from a community with high STD rates. Young women in different contexts may have different patterns of sexual activity and abstinence, or different intrapersonal and relationship characteristics, and these will need to be identified.

### Implications

Our findings have potential implications both for prevention programs and for clinical care of adolescents. Prevention programs may want to adapt their content to the typical pattern of sexual activity in their target population. To provide targeted and timely sexual health counseling, clinicians may want to ask not only whether adolescents are sexually active, but when they last had sex. Counseling can be tailored to recent patterns of sexual activity. In the case of shorter periods of abstinence, clinicians may want to focus on immediate influences of decision making; for longer periods, they should focus on relationship contexts of sexual behavior.

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